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AN

ESSAY

CONCERNING THE CAUSE OF THE
ENDEMIAL COLIC

OF

DEVONSHIRE,

WHICH WAS READ IN THE THEATRE OF THE COL-
LEGE OF PHYSICIANS, IN LONDON, ON THE
TWENTY-NINTH DAY OF JUNE, 1767.

BY GEORGE BAKER,

FELLOW OF THE COLLEGE OF PHYSICIANS, AND OF
THE ROYAL SOCIETY, AND PHYSICIAN TO
HER MAJESTY'S HOUSEHOLD.

Ἐκ τούτων νοσοῦμεν, οἷς καὶ ζῶμεν.

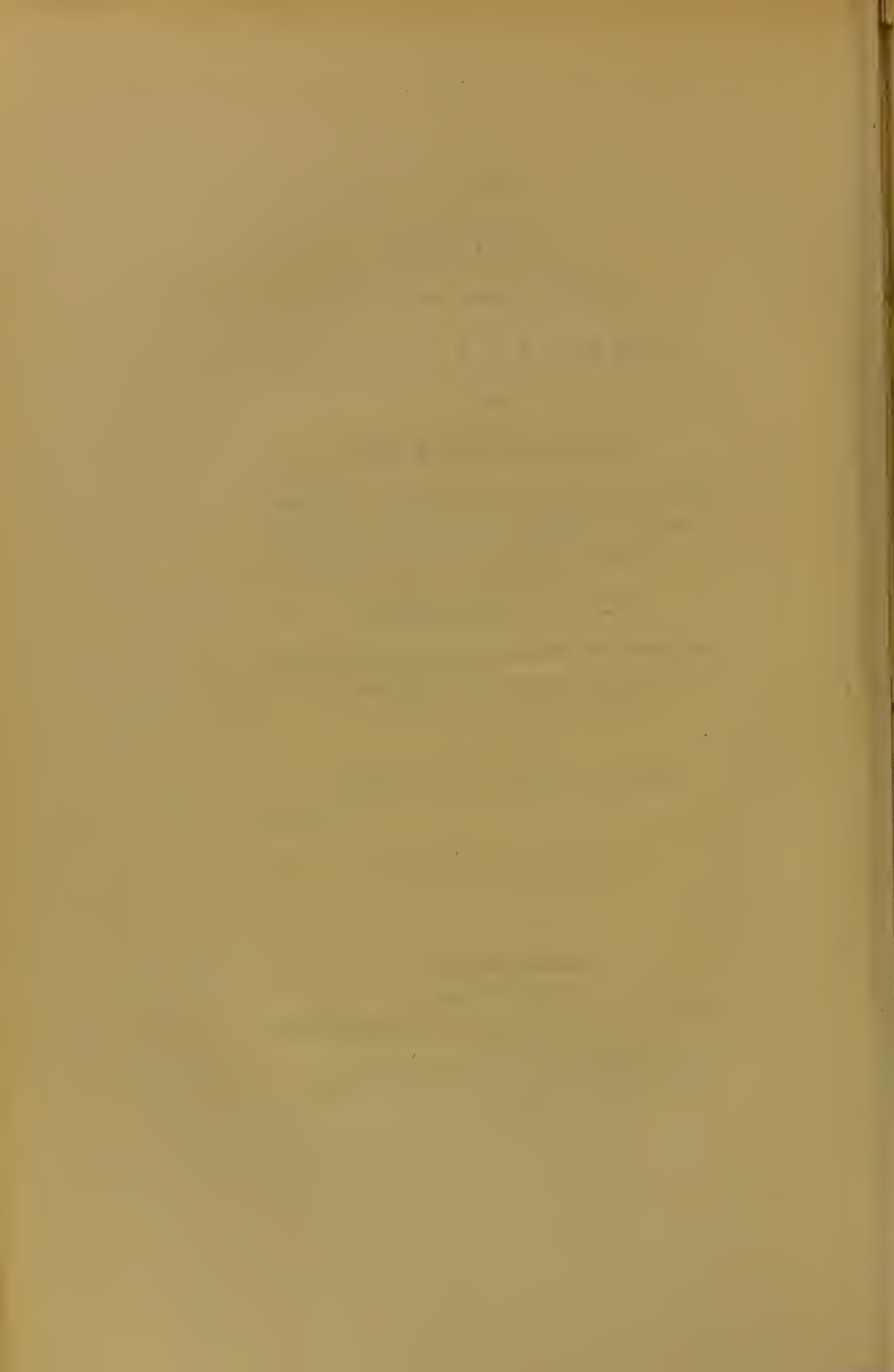
PLUTARCH.

SECOND EDITION.

LONDON:

PRINTED BY W. BULMER AND CO. CLEVELAND-ROW,
ST. JAMES'S,
FOR MESSRS. PAYNE AND FOSS, PALL-MALL.

1814.



TO

SIR RICHARD WARWICK BAMFYLDE,
BARONET,

AND

JOHN PARKER, ESQUIRE,

THIS

ESSAY,

ON A SUBJECT PARTICULARLY INTERESTING TO
THE COUNTY, WHICH HAS THE HAPPINESS
OF BEING REPRESENTED BY THEM
IN PARLIAMENT,

IS,

WITH THE GREATEST RESPECT, INSCRIBED

BY

THEIR MOST OBEDIENT,

AND MOST HUMBLE SERVANT,

GEORGE BAKER.



AN
ESSAY
CONCERNING THE CAUSE OF THE
ENDERMIAL COLIC
OF
DEVONSHIRE.

A VERY small acquaintance with the writings of Physicians is sufficient to convince us, that much labour and ingenuity has been most unprofitably bestowed on the investigation of remote and obscure causes ; while those, which are obvious and evident, *quæ ante pedes sunt*, which must necessarily

be acknowledged as soon as stumbled upon, have been too frequently overlooked and disregarded. Such a spirit of investigation has, in several instances, been the parent of dangerous errors in practice; inasmuch as men are apt to be as partial to their own conceits, as to their own offspring; and seldom forget opinions at the bed-side, which have been the result of much contemplation at home. It must however be acknowledged, that such a spirit is a fault not so much to be imputed to the present, as it was to the last age. We have now learned to attend to Nature; to observe diseases, and the genuine effects of medicines on the human body; and to make

experiment the great *basis* of our reasoning. And although, in many cases, we subscribe to the doctrine of that sect of Physicians, who, according to Celsus, called themselves *Ἐμπειρικὸς*, *ab experientia*, that *non intersit quid morbum faciat, sed quid tollat*; yet we are not such Empirics, in the modern sense of the word, as to pay no regard to those causes, which are manifest and within our reach; such causes more especially, as lead us directly either to the cure of diseases, or to the prevention of them.

With respect to the provincial disease, which is the subject of this essay, I shall at present content myself with considering its origin.

And if I am not mistaken in that, it would seem that, in this instance, *cognitio causæ morbum tollet* ; that an obvious method is pointed out, by which this colic may become no longer an endemial disease in one part of England ; and perhaps, in other parts, less frequent than it is at present. A malady, so formidable as well in its immediate effects, as in its more distant consequences, it is an office of humanity, as much as possible, to prevent. We may gain credit even in avoiding an enemy of superior force ; and when we find ourselves unequal to the contention, it is a kind of victory to make our escape,—

fallere et effugere est triumphus.

The earliest account of the Devonshire colic, which I have met with, is in Dr. William Musgrave's *Dissertatio de Arthritide Symptomática*, published in the year 1703. In the fifth section of the tenth chapter *de Arthritide ex colicâ*, is the following passage. “ Alia vero
 “ colica, apud Damnonium, ex
 “ pomaceo immiti et acido, nimis
 “ usurpato, derivatur; id quod ex
 “ eo liquet, siquidem illos solum
 “ infestat, qui potioni isti assuevere,
 “ eademque ratione qua sunt as-
 “ sueti: sic ut iis tempestatibus,
 “ quæ pomaceo abundant, crescat,
 “ et in vulgus ea grassetur; contra
 “ vero, Pomona copiam negante,
 “ rarius obversetur.” It seems very particular, that Dr. Musgrave

should say so much of this colic, which is represented to be the effect of cyder; and not mention those essential and pathognomonic symptoms, by which it is at this time distinguished. Are we to suppose that, when Dr. Musgrave lived, this species of colic had not been observed to terminate in palsy, or epilepsy? Or is it more probable, that his attention was so engrossed by the general subject of his dissertation, that he forgot to mention such remarkable *phænomena*? That he was well acquainted with a disease exactly similar to Dr. Huxham's *morbis colicus Damnoniorum*, namely the colic of Poitou, is very certain, for in the fourth history of the same tenth chapter, he men-

tions the case of a gentleman, who
 “ ætatis flore, colica, quam Pictoni-
 “ cam appellant, aliquamdiu vexa-
 “ tus, ex more et progressu istius
 “ mali ordinario, incidit in para-
 “ lysin; artus exinde marcidos,
 “ graciles, ἀκινήτους habens; per
 “ reliquum vitæ clinicus. Paralyti-
 “ sub ejus initium accesserunt
 “ dolores erratici, incerti, horum,
 “ illorum artuum internodia cru-
 “ ciantes, autumnis et tempestate
 “ pluvia maximopere sævientes, et
 “ ad amussim rheumatismum si-
 “ mulantes.”

It is indeed possible, that Dr. Musgrave might not often have seen the colic, which he mentions as peculiar to the drinkers of cyder;

for, as I am informed, orchards were not in his time much cultivated in the country near Exeter, where Dr. Musgrave resided ; and there was no county-hospital at that time established. And Dr. Huxham testified in the year 1739, that there was at that time ten times more cyder made and drunk in the County, than there had been about thirty or forty years before.

Dr. Huxham's *opusculum de morbo colico Damnoniorum*, which he first published in the year above-mentioned, contains a very full description of the malady, which is the subject of our present inquiry. He informs us, that " in " the beginning of the Autumn

“ 1724, it spread itself over all the
 “ county of Devon, among the
 “ Populace especially, and those
 “ who were not very elegant and
 “ careful in their diet; and that,
 “ though it may not rage with the
 “ same degree of violence, and
 “ may affect a vastly less number
 “ of People, yet it infests that
 “ County more or less every Au-
 “ tumn.” Whoever peruseth Dr.
 Huxham’s description, will readily
 determine the *morbis colicus Dam-*
noniorum to be precisely the same
 disease, which, in the year 1617,
 was described by Francis Citois, a
 native of Poitiers, afterwards Phy-
 sician to the King of France, and
 to the Cardinal Duc de Richelieu,
 under the title of *novus et popularis*

apud Pictones dolor colicus biliosus.

Indeed it seems to be acknowledged by Dr. Huxham, that what is called *Colica Pictonum*, “ which
 “ kind of disease,” says he, “ is
 “ very common in the West-
 “ Indies,” is similar to the disease
 which he describes; “ arising from
 “ a similar cause, to wit, too* great
 “ an use of the very acid juice of
 “ lemons, and requiring much the
 “ same method of cure.”

Dr. Huxham refers the cause of

* I am credibly informed, that, at this time, both in the West Indies, and in the northern colonies of America, the juice of lemons and limes is not only much trusted to as the cure of this disease, but that it is even esteemed to be a preservative from it.

the Devonshire colic principally to a very gross, essential, acid salt, or tartar, with which the expressed juice of apples, whilst unfermented, abounds. He thinks that “ by
 “ long and frequent drinking a
 “ liquor of this kind, such a quan-
 “ tity of crude, gross tartar is thrown
 “ into the blood, that it thence
 “ becomes very acrid; and not
 “ only the blood, but, from that
 “ impure source, all the humours
 “ thence secreted. So that instead
 “ of a very soft, lubricating *mucus*
 “ separated by the glands, disco-
 “ vered by Dr. Havers, we have
 “ as it were a sharp, coagulated
 “ matter, whence arises a great
 “ pain in the joints, and impotence

“ of their motion.—Instead of an
 “ exceeding soft lymph to moisten
 “ the nerves, a corrosive ichor;
 “ and hence epileptical attacks.
 “ Moreover, the blood being satu-
 “ rate with such a great quantity of
 “ salts, they attract one the other
 “ strongly, and form greater *mole-*
 “ *culæ* than can pass through the
 “ lymphatic arteries, scarce indeed
 “ through the sanguineous capilla-
 “ ries; hence various obstructions,
 “ and great irritation on the ner-
 “ vous extremities. At length even
 “ the very Bile, that variously
 “ useful balsam of the body, be-
 “ comes corrupted and quite ener-
 “ vated by the super-abundant
 “ apple-acid, though in its natural

“ state it was designed to correct
 “ acidity.”*

Thus I have extracted a specimen of Dr. Huxham's doctrine; and for the remainder of his very ingenious theory I shall refer you to the treatise itself; where you will find a sentiment, which perhaps is applicable on the present occasion.—“ *Sine experientia vana
 “ omnis theoria, bella sit utcunque.*” For, notwithstanding the deference, which I always pay to the authority of this celebrated Physician, I have for some time conceived

* See Dr. Huxham's treatise on the Devonshire colic, translated from the Latin original, and published with the Doctor's approbation.

doubts concerning the solidity of this doctrine. When I have considered, that there is not the least analogy between the juice of apples, and the poison of lead; and that this colic of Devonshire is precisely the same disease, which is the specific effect of all saturnine preparations; it has not seemed to me at all probable that two causes, bearing so little relation to one another, should make such similar impressions on the human body. No author, whom I have had an opportunity of consulting, has given any intimation of having conceived the same suspicion with myself, except only the anonymous author (supposed to be M. Bouvart) of *Examen d'un livre qui a pour*

titre T. Tronchin de Colica Pictonum, par un Médecin de Paris. This writer says, in a cursory manner, and without seeming to lay any stress on what he throws out, “ Il
 “ est possible, que les vins, dont
 “ parle Citois, et les cidres, dont
 “ parle M. Huxham, aient été, sans
 “ qu’ils l’aient pu découvrir, altérés
 “ avec la litarge, ou quelque autre
 “ matière semblable.” It is evident however from what this Author afterwards says, in the forty-sixth page, that he was very far from forming any settled opinion on this subject. “ Ces trois causes, scavoir
 “ la bile, les matières minérales
 “ vénimeuses, et les vins verds et
 “ austères, quoique différentes en
 “ apparence, produisent, malgré ce

“ qu'en peut dire M. Tronchin,
 “ des coliques à peu près de même
 “ espèce.”

But to return to Dr. Huxham.—
 And first, how much soever our
 Cyder may agree with Rhenish
 and Moselle wines in the circum-
 stance of containing a large quan-
 tity of essential salt, of a similar
 figure ; no argument, from analogy,
 will here be valid, unless it can be
 shewn that Rhenish and Moselle
 wines have ever produced the
 colic of Poitou in an unadulterated
 state.*

* Ce qu'il y a de certain, c'est que la
 colique, dont il est question, a été épidémique
 dans les pays où l'on boit des vins de Rhin

Secondly, if Cyder is the cause of this disease, as being an acid, why is the colic of Poitou very little known in the eastern countries, where the Turks, whose religion obliges them to abstain from wine, drink every day very large quantities of an acid sherbet? Does the experience of jockeys, who, in order to reduce themselves to a certain standard of weight by sweating, are said to drink largely of vinegar, strengthen such an observation? Do we find it to be

et de la Moselle. Ces vins péchent souvent par trop de verdure ; et les Marchands les ont long tems altéré avec la litarge. [Examen d'un livre qui a pour titre T. Tronchin de Colica Pictonum, par un médecin de Paris, p. 7.]

true, that children, and valetudinary people, and particularly chlorotic girls, whose *primæ viæ* abound with acid, are on that account subject to this colic? Is not a *Diarrhœa*, or *Cholera*, the ordinary effect of eating unripe fruit immoderately? What reason can be given, why the poorer inhabitants of the counties of Worcester, Gloucester, and Hereford, who use, as their common drink, a weak acid cyder, are subject to no such colic? Why is this disease no longer endemic in the province of Poitou? Is it that the grapes are brought to more maturity, than they were formerly? Has the Sun more power now than in the time of Citois? Why, in the Bahama-islands, is this disease

unknown? I am informed by a gentleman, who lived there many years, that this has been the case, ever since rum has been no longer distilled in those islands. The same gentleman informs me, that the inhabitants drink very large quantities of small punch, made extremely acid with the juice of limes; the labouring people to the amount of two gallons of it every day. And lastly, is it reasonably to be suspected, that the essential salt of a vinous liquor can raise such tumults in the bowels, whether by corrupting the Bile, or otherwise; when it is vulgarly known, even among the Miners in Derbyshire, that Patients, afflicted with this same disease, do not receive a more im-

mediate, or a more important relief from any medicine whatever, than by taking large and repeated doses of this very essential salt, the *Cremor Tartari*; and when it appears, that Dr. Hillary greatly depended on it for the cure of the dry-belly-ach in the West-Indies? Zeller, in his *docimasia, signa, causæ, et noxa vini lithargyrio mangonisati*, gives an account of the revival of the adulteration of wine with litharge in the Duchy of Wirtemberg, in the beginning of the present century. In this dissertation he asserts, that though the wines, in the neighbourhood of Tubinga, were as acid as vinegar, the inhabitants had long drunk them with impunity, till this fraud was introduced. “Con-

“ stat viciniam nostram, ubi alias
 “ montes lachrymantur, acetum, et
 “ istiusmodi vina immatura et acida
 “ per plures annos, imo lustra ab
 “ incolis et militibus largiter hausta
 “ fuerunt, ab omnibus tamen his
 “ symptomatibus penitus liberam
 “ fuisse, cum a fuco quoque libera
 “ fuerit: Imo in ipsa hac nostra
 “ Civitate, quæ ante duo lustra tru-
 “ culentia hac tantum non op-
 “ pressa fuit, postquam fraudem
 “ hanc plurimi tam Vietores, quam
 “ Caupones, tecte quidem exercu-
 “ erunt, omnes isti, qui a Caupo-
 “ nibus vinum vel non emerunt,
 “ vel in eorum ædibus non bibe-
 “ runt, a torminibus et cruciatibus
 “ hisce immunes evaserunt; licet
 “ eorum domestici per aliquot

“ annos austerum et acidissimum
 “ hauserint vinum, ut acidius gus-
 “ tari vel dari nequeat; aliis interea,
 “ quos dulcedo inescavit, miserrime
 “ patientibus, aut enervatis, elum-
 “ bibus redditis, pendulis artubus
 “ et resolutis incedentibus, aut neci
 “ traditis; plurimi enim miserrime
 “ perierunt.”

The experiment, mentioned by
 Zeller, proves nothing against the
 general wholesomeness of acids.
 Upon his giving to a dog three
 ounces and a half of very strong
 vinegar, the respiration of the
 animal immediately became sono-
 rous and difficult; and he died in
 the third hour after he had swal-
 lowed the vinegar, having thrown

up great quantities of froth, which at last was mixed with blood. The dog being opened, no signs of inflammation appeared in the stomach: the mischief is described to have been in the lungs only. Some of the vinegar probably found its way into the lungs; and suffocation seems to have commenced in the very act of swallowing. Whereas Brunnerus, (*Ephemerid. Germanic. an. 4. observat. 92.*) who killed a dog with an ounce of powder of litharge, dissolved and boiled in vinegar, found the effects of that poison to be principally in the stomach, intestines, urinary bladder, and the rest of the *viscera* of the *abdomen*.

I shall only add one more observation concerning acids. Physicians, who have resided some time in the hotter countries, have testified, that there are no better remedies against spasms, dysenteries, and the other endemial diseases in hot climates, than the acid vegetables, with which Nature has most liberally supplied the warmer countries. This opinion is expressed in a strong manner by Jacobus Bontius in his *Historia Naturalis Indiæ Orientalis*, lib. vi. cap. 27.

“ Videtur Natura voluisse ex pro-
 “ fesso multas acidas et constrin-
 “ gentes herbas e terra producere
 “ contra violentos et endemios
 “ morbos, dysenteriam nempe,
 “ choleram, et spasmus, plerum-

“ que a Bile ortos : ut quasi digito
 “ monstraret, ubi hæc vel similia
 “ mala nascuntur, ibi locorum re-
 “ mediorum manifesta et etiam
 “ occulta qualitate pugnantium
 “ penuriam non fore.”

It seems therefore not to have
 been without sufficient foundation,
 that I have for some time suspected,
 that the cause of this colic is not to
 be sought for in the pure Cyder ;
 but in some, either fraudulent, or
 accidental, adulteration.

Upon enquiry, I find that the
 disease is very common all over
 the county of Devon ; but that it
 particularly infests those parts of
 the county, where the greatest

quantities of Cyder are made. I likewise find that it is not only common among the lower class of inhabitants; but that it is much more frequent among people of all ranks, than in other parts of England; and that it is not entirely confined to the autumnal season. Not long ago I had an opportunity of seeing several wretched victims to this cruel disease; who answered to the representation drawn by Citois. “ Per vicos, veluti larvæ,
 “ aut arte progredientes statuæ,
 “ pallidi, squallidi, macilenti conspicuntur, manibus incurvis et
 “ suo pondere pendulis, nec nisi
 “ arte ad os et cæteras supernas
 “ partes sublatis, ac pedibus non
 “ suis, sed crurum musculis, ad

“ridiculum, ni miserandum, in
 “cessum compositis, voce clangosa
 “et strepera.”

I lately received from Dr. Andrew
 of Exeter the following account of
 all the Patients, under this disease,
 admitted into the hospital at Exeter
 since September 1762.

From Sept. 1762 to Sept. 1763	— 72
Sept. 1763 to Sept. 1764	— 75
Sept. 1764 to Lady-Day 1766	— 86
Lady-Day 1766 to July 6, 1767	— 52
	<hr/> 285

Of this number 209 were cured.

Dr. Andrew likewise informs
 me that Patients are brought to the
 Exeter hospital from all parts of the
 county ; but chiefly from those

parts, where most cyder is made.
 —That the most violent symptoms of this disorder, such as pain and costiveness, are generally removed, before the sick are brought to the hospital; and that nothing commonly remains but a paralytic weakness in the arms. Dr. Andrew adds, “ I have known this complaint cured radically; tho’ I confess, a return often happens. When the disease proves obstinate, we always endeavour to get our Patients into the hospital at Bath; the Bath-water, tho’ not a specific, being esteemed by us the most effectual remedy, both internally and externally used.”

According to my information

eighty Patients, under the effects of the Devonshire colic, were admitted into the Bath-hospital in the course of the last year; forty of whom are said to have been cured, and thirty-six sent away greatly relieved. I likewise am informed from the Bath-hospital, that the proportion of such patients from Devonshire, to that from the counties of Hereford, Gloucester, and Worcester, is generally as eight to one.

In some letters, which I have lately received from Dr. Wall, of Worcester, the following facts are mentioned. “ The counties of
 “ Hereford, Gloucester, and Wor-
 “ cester, are not, so far as I know,
 “ subject to the colic of Poitou, or

“ any other endemic illness, unless
 “ it may be the rheumatism; which,
 “ I think, the inhabitants of Here-
 “ fordshire are more liable to, than
 “ those of some other counties.
 “ There is no Lead, which can
 “ give occasion to that colic, used
 “ in any part of the *apparatus* for
 “ grinding or pressing the apples,
 “ or fermenting the liquor. Once
 “ indeed, in a plentiful year of
 “ apples, I knew a Farmer, who,
 “ wanting casks, filled a large leaden
 “ cistern with new cyder, and kept
 “ it there till he could procure
 “ hogsheads sufficient to contain
 “ the liquor. The consequence
 “ was, that all who drank of it were
 “ affected by it as the Lead-work-
 “ ers usually are. We had eleven

“ of them, at one time, in our In-
 “ firmary.

“ I have lately had two or three
 “ Patients in that distemper, occa-
 “ sioned by their having drunk
 “ cyder made in a press covered
 “ over with Lead. But this fact
 “ of a cyder-press covered with
 “ Lead, is a singular, and perhaps
 “ the only instance of the kind in
 “ this part of England. It hap-
 “ pened in a part of the county of
 “ Worcester, adjoining to War-
 “ wickshire, where very few apples
 “ grow ; and the bed of the press
 “ being therefore cracked by disuse,
 “ the sagacity of the Farmer con-
 “ trived this covering, to prevent
 “ a loss of his liquor. In general,

“ the cyder-drinkers with us are
 “ healthy and robust; but for the
 “ most part lean. The liquor is
 “ clear, and passes off readily by
 “ urine and perspiration; which
 “ enables the common people to
 “ drink immense quantities of it
 “ when at labour, to the amount
 “ of several gallons in a day. I
 “ have heard it observed by a Phy-
 “ sician, late of this place, who
 “ was much concerned in the cure
 “ of Lunatics, that more of those
 “ unhappy Persons came to him
 “ from Herefordshire, than any
 “ other place. The fact, if true,
 “ may possibly arise from the quan-
 “ tity drunk, rather than the qua-
 “ lity.”

Were the *apparatus* for making cyder the same in all the cyder-counties, it would appear very remarkable, that the inhabitants of one county should experience such terrible effects from the use of this liquor, while those of the other counties drink it with impunity. But, if we inquire into the method of making cyder in the county of Devon, we shall be able to conjecture with some degree of probability, what it is that occasions such a difference. The large circular trough, in which the apples are ground, is generally composed of several pieces of moor-stones, cramped together with iron, some melted Lead being poured into the interstices. It frequently happens,

that these stones, which are thus to be joined, are unequal, and do not correspond with each other ; so that considerable chasms are left between them ; and these chasms are filled up with lead. In this case the apples, ground by the pressure of the roller, immediately come in contact with no small quantity of this poisonous mineral.

It is likewise common, in several parts of the county, either to line the cyder-presses entirely with Lead, in order to prevent their leaking ; or to make a border of Lead quite round the press, in order to receive the juice of the apples, and to convey it into a vessel, made of wood or stone, placed underneath.

And in many other places, where these methods are not used, it is common to nail sheet-lead over any cracks or joints in the presses ; and likewise to convey the juice of the apples from the presses in leaden pipes. Moreover I am informed, that it is the practice of some farmers, in managing their weak cyder, made early in the year, before the apples are ripe, to put a leaden weight into the casks, in order to prevent the liquor from growing sour ; and that this cyder is the common drink of their servants and labourers. But I am willing to believe, that this pernicious method of adulteration (against which severe laws have been enacted, as well in France as in Ger-

many, and which crime, in both countries, is deservedly punished by death) is not often practised by our countrymen.

Dii meliora piis, erroremque hostibus illum!

Dr. Wall informs me, that in some parts of the counties of Hereford, Gloucester, and Worcester, the mills, in which the apples are ground, being 16, 18, or 20 feet in diameter, consist of several pieces of stone or timber, joined together with cramps of iron, fastened with Lead : but that these cramps are fixed in the *bed* of the mill, or on the outside of the curb, and not in the groove where the apples are ground. The same gentleman observes, that, if many

apples, full of juice, lie long on the *bed* of the mill, (where the apples are placed in an heap, that they may be ready to be thrown into the groove,) some of which may perhaps be rotten, others bruised in the gathering, and a moisture spread over the whole, from the fermentation and sweating of the fruit, it may perhaps be doubted, whether some part of the Lead, used in the cramps, may not be dissolved; though it must be, at most, in a quantity extremely small; there being but very little Lead used in the junctures; and the surface exposed to the apples being almost imperceptible. But I am informed by another person, that in many parts of Herefordshire,

and the neighbouring counties, the stones of the mills are joined together with putty ; (which is whiting, mixed with oil into a tough paste) and that neither iron nor Lead are originally used in the construction of them ; but that, if any of the joints, in wearing, happen to start (which is sometimes the case) they are repaired with iron cramps fastened with lead.

These facts having been well ascertained, I determined to make use of the first opportunity, which might occur, of informing myself by experiment, whether or no there are really marks of a solution of Lead in the cyder of Devonshire. Being therefore, in the month of

October 1766, at Exeter, I procured some of the expressed juice of apples, as it flowed from a cyder-press, lined with Lead, in the parish of Alfington. On this I made and repeated several experiments by means of the *atramentum sympatheticum* or *liquor vini probatorius* described by *Neuumann*; and of the volatile tincture of sulphur. These experiments entirely satisfied me, that the Must contained a solution of lead. The same experiments were made on some cyder of the preceding year. This likewise shewed evident signs of lead contained in it; but in less proportion than in the Must.

But, being unwilling to make

any positive assertion, solely on the authority of my own trials, more especially as I had been under the influence of a preconceived opinion; I brought with me to London some of the same Must, which I had examined at Exeter. This Must, together with some Devonshire cyder of the preceding year, which I purchased of the maker, (who assured me that he used no Lead in any part of the *apparatus* for making cyder, except only what is necessary for composing the trough, as was mentioned above,) were the subject of some experiments, in making which, Dr. Saunders, an ingenious Gentleman, who teaches Chemistry, kindly gave me his assistance.

Before I give an account of the several experiments, which we made, in order to ascertain this adulteration, it may be proper to make a few observations, which will perfectly explain the mode of union, which takes place between wine, or cyder, and lead.

The expressed juice of the grape, or of the apple, has a considerable quantity of acid united with the saccharine matter. This juice, when subjected to fermentation, has its acid, during the progress of that fermentation, gradually assimilated and converted into an alcohol or inflammable spirit. But if the original juice, or Must, be crude and acid, without having much saccha-

rine matter in it, the native acid is with difficulty assimilated; or, when it arrives at the proper period of assimilation, it does not remain there stationary, but hastens on to the acetous fermentation. When lead is added to such wines, their acidity is covered; a sweetness is communicated to them; and their acetous fermentation is checked.

The richer wines, of which the original juice contains a large proportion of saccharine matter, are less liable to adulterations of this kind, than the poorer wines of northern climates, such as the Rhenish and the Moselle wines, and our English cyder.

It is here to be observed, that the vegetable acid, either in its native state of Must, or in its fermented state of vinegar, or in its intermediate state of cyder, very readily receives an impregnation from Lead, whether it be applied in its metallic or calcined state. We are therefore to consider Lead, when united with wines, as in the condition of *saccharum Saturni*.

By attentively observing the variety of changes produced by certain bodies, when added to a solution of *saccharum Saturni*; and by applying these observations to the wines, which are the most frequent subjects of this adulteration, Chemists have been enabled to

detect such frauds, wherever they have existed.

EXPERIMENT I.

A small quantity of Devonshire cyder being exposed upon clean paper to the fumes of the volatile tincture of sulphur, became immediately of a darkish colour, approaching to black. And we could only imitate this colour by exposing a dilute solution of *saccharum Saturni* to the same fumes. A small quantity of cyder, made in the county of Hereford, exposed in like manner to the same fumes, exhibited no such appearance, until a few drops of a solution of *saccharum Saturni* were added to it.

OBSERVATION I.

From this experiment we are to understand that the acid, before united with the Lead in the cyder, and the volatile alkali in the tincture of sulphur, mutually attracted each other; and that it was the precipitate of the Lead united with the sulphur, which produced the dark colour above-mentioned.

EXPERIMENT II.

A small quantity of *Hepar Sulphuris* (prepared by digesting together in a sand-heat one ounce of orpiment, and two ounces of quicklime, with twelve ounces of water, in a close vessel) being added to

some Devonshire cyder, in a few minutes occasioned a darkish colour in the body of the liquor, approaching to black; and the whole became very opake. No such change was produced in the cyder of the county of Hereford, until a few drops of a solution of *saccharum Saturni* were added; when the same appearance, which was produced in the Devonshire cyder, was perceived.

OBSERVATION II.

The reasoning, made use of in the former observation, is applicable here. The decomposition of the *saccharum Saturni* and of the *Hepar Sulphuris* was effected by the same laws of elective attraction.

EXPERIMENT III.

To a small quantity of Devonshire cyder a few drops of *Hepar Sulphuris* (prepared by boiling equal parts of fixed vegetable alkali and sulphur together in water) were added; and a precipitation of a very dark colour was produced.

When some Herefordshire cyder was treated in the same manner, the precipitate produced was as white as milk; and it was only upon the addition of a few drops of a dilute solution of *saccharum Saturni*, that a precipitate of the same colour with the former could be obtained.

OBSERVATION III.

There is some nicety required in making this experiment. The *Hepar Sulphuris* is not to be added in any large quantity; for as all the lead is precipitated upon the first addition, it is easy to perceive the several successive shades of colour in the precipitate, until all the lead is separated; and then the precipitate, upon a farther addition of *Hepar Sulphuris*, assumes the whiteness of the precipitate obtained from the Herefordshire cyder, which entitles it to the appellation of *Lac Sulphuris*. If a large quantity of *Hepar Sulphuris* be at once added, the whiteness of the too copious precipitate is such,

as to render the dark colour of what is first precipitated imperceptible.

EXPERIMENT IV.

Some Devonshire cyder was examined by means of the volatile tincture of sulphur, as in Experiment III. A very dark coloured precipitate was obtained. A similar precipitate could only be obtained from Herefordshire cyder, after that a weak solution of *saccharum Saturni* was added to it.

Some of the Must (taken from the press in the parish of Alfington, as was mentioned above) treated in the same manner with the cyder, produced precipitates of a deeper

black colour. This sufficiently shews, that the solution of Lead in the Must was stronger than that in the cyder.

It is a matter of no consequence, whether the Lead, the existence of which is proved, was applied to the cyder in its state of Must, or in that of a vinous liquor. However, as the Must afforded more considerable signs of impregnation than the cyder, it would seem probable that the lead was added to the Must; and that, as the acid, during the fermentation, is in a great measure converted into alcohol, a proportional quantity of lead will consequently be precipitated.

The same experiments were afterwards tried on several other specimens of Devonshire and of Herefordshire cyder. The result of them was constantly and uniformly the same as has been described.

It has been proposed by several Authors, to detect such adulterations of wines by means of the vitriolic or of the muriatic acid; which, by uniting with the lead, will make it precipitate. But it is ascertained by the experiments, made by Professor Gaubius, that trials, made with the acids, are less conclusive than those which have been described.

EXPERIMENT V.

In order to leave the matter entirely without doubt, an extract from 18 common quart bottles of Devonshire cyder (first strained through a cloth) which had been in my cellar more than three months, was prepared. This extract, being assayed with the black flux, a quantity of Lead, weighing four grains and an half, was found at the bottom of the crucible. These experiments were made in October 1766.

In the latter end of the last century, when the physicians of Germany (particularly Vicarius, Cockelius, and Brunnerus, whose disser-

tations on this subject may be found in the *Ephemerides Germanicæ*) had taken great pains to discover the true cause of the epidemic colic, which, to use the language of Brunnerus, (*Ephemerid. Germanic. Dec. 3. an. 4. observat. 92.*) “ non minus ægrotantium viscera, quam medentum animos, torserat;” and when they had at last demonstrated, that this disorder was wholly to be referred to small acid wines, adulterated with litharge, there appeared a writer (a certain Seerup, a physician of Copenhagen) who endeavoured to exhibit a specimen of his reading and ingenuity, by maintaining a bold paradox. This man, in very pompous language, and with an

air of the greatest confidence, asserted in his *triumphus lithargyriatorum*, that no danger was to be apprehended from wines in which litharge was dissolved; and that all the ill effects, supposed to have been derived from that cause, were really to be attributed to the austere acid of wine made of unripe grapes. This opinion he endeavours to defend by the authority of Drawitzius, Sennertus, Van Helmont, Theodorus Zwinger, Boyle, Wepfer, and several other Writers. He likewise quotes several authors, to shew the salutary effects produced in the human body by the internal use of lead; and insists, in virtue of their testimony, that it had cured affections of the spleen, arising

from an acid cause ; the hypochondriacal disease ; sudden inflammations ; colics occasioned by the *Bilis æruginosa* ; obstinate quartan fevers ; ulcerations of the lungs, as well as of other parts ; and the plague itself. He adduces other authorities to shew, that the *Aqua Saturni* had been of very great use in disorders occasioned by worms ; that the *Spiritus Saturni* had cured the leprosy ; that Paracelsus held it to be a specific remedy in madness ; and that in the small-pox, and all other inflammations, it had been proved to be an efficacious medicine : that it was the great sudorific medicine of Faber ; and that it was Mynsicht's secret for the cure of the *phthisis*, and diseases

of the spleen and colic ; and that the great success, which had attended the practice of Petrus Matthias was to be ascribed to the use of *Saccharum Saturni*, and other preparations of lead : and lastly, that a constipation of the belly could not justly be attributed to *Saccharum Saturni*, since Antonius de Heide asserts, in his medicinal observations, that he cured that disorder by administering to his patients five grains of that remedy, mixed with Crabs-eyes.

It is presumed that, the presence of lead in the Cyder of Devonshire being demonstrated, there is no one, at this time of day, likely to revive the argument of Seerup, and

still insist on the deleterious quality of the acid: For a poison is discovered, which is experimentally known to be adequate to all those dreadful effects, so pathetically described by Dr. Huxham. It is likewise presumed that no opinion, unsupported by facts and experience, (how respectable soever the character of its author may be) will be admitted in evidence, when contrasted with the authority of a fact, which seems to be clearly demonstrated to our senses.

The general character of lead, and the preparations of lead, when given internally, has been, that they cool, incrassate, repel, absorb, and obtund acrimony. And it is

very well known, that their real power has, in many instances, seemed to answer to such a general character; for there are scarcely any medicines, which produce their effects more immediately, or with greater certainty, in colliquative sweats, in fluxes, and in hæmorrhages. But it is as well known, that the relief given, which, for the most part, is only temporary, has been frequently followed by violent pain in the bowels, obstinate costiveness, suppression of urine, tremors, spasms, palsy, asthma, and suffocation. And although, if we give credit to the testimony of credible writers, we must allow that Patients, of certain constitutions, may have taken these medicines

with success, and with impunity; yet surely Physicians cannot be too cautious in avoiding the use of medicines, the effect of which, for aught that they can presume to ascertain, may be more formidable than the diseases to which they are opposed. That preparations of lead were formerly very fashionable medicines, we may judge from the oldest dispensatories, in which we find an almost infinite number of Magisteries, Elixirs, and Balsams, which have that metal for their *basis*.

We are informed by Mr. de Haen, that the use of these medicines is much more common even now than is generally imagined.

He thinks that the number of Patients, affected by the colic of Poitou, is immensely increased by such means. He mentions the *formula* of a medicine, compounded of \mathfrak{z}^i of *Saccharum Saturni*, \mathfrak{z}^i of Cerusse, and \mathfrak{z}^{vi} of water. By this medicine taken *cochleatim*, a Patient, he says, was cured of a *gonorrhæa*; but soon afterwards was seized with the most excruciating pain in his bowels, followed by a vomiting of his excrements. He adds, that this man, though he escaped death, even after three years, felt and lamented the reliques of that most dreadful cure. I could quote from my own experience more than one instance of cases, in several respects similar to this, which I have

taken from Mr. de Haen's *ratio medendi*.

What then can we think of the practice of the Chinese, who very frequently administer internally various preparations of lead, to which they ascribe extraordinary virtues? The observation made on this subject by Mr. Malouin, in his *Chymie Médicinale*, seems judicious. “ En réfléchissant sur l’usage
 “ intérieur que les Chinois font
 “ du Plomb, on est porté à croire
 “ que ces peuples sont différem-
 “ ment construits ou tempérés; ou
 “ que leur Plomb diffère du nôtre.”

Dr. Huxham finds it a difficulty to account for the reason, “ why

“ the juice of apples in one year
 “ produces a costive belly, with
 “ violent colical pains, but in ano-
 “ ther, a loose belly with scarce
 “ any gripes attending.” I have
 been informed by others, that
 small quantities of new cyder will
 frequently produce a *diarrhœa* in
 every year. But Citois observes,
 that the colic, which infested the
 inhabitants of the province of
 Poitou, was often attended, “ per
 “ initia præsertim, cum alvi fre-
 “ quenti, sed non ita copioso,
 “ fluore, sæpius cum ejusdem ad-
 “ strictione.” M. Douzam, who
 writes on this disease in the *Journal*
de Médecine for the month of Octo-
 ber, 1760, affirms that “ Il en est
 “ plusieurs, qui non seulement

“ n’ont point éprouvé de constipation, mais même qui se sont plaints d’un flux de ventre.”

The same thing is sometimes observed in the case of painters, and of other workmen employed about Lead. Some of them are cured by a spontaneous looseness of the belly. Mr. James Wilson, who (in the *Essays and Observations physical and literary*, published at Edinburgh, Vol. 1. Art. 22.) gives an account of a disease, called by the miners *Mill-reek*, which all the inhabitants of *Lead-Hills* are subject to, but particularly those, whose daily business it is to melt down the Lead, observes, that, in the first stage of this disease, a diarrhœa sometimes makes a cure.

A question may be asked, “ If
 “ the mischiefs occasioned by
 “ Cyder, particularly when it is
 “ new, arise from the poison of
 “ lead dissolved in it, how happens
 “ it, that all who drink this liquor,
 “ do not suffer in proportion to the
 “ quantity of poison swallowed ;
 “ and that some people, who have
 “ long accustomed themselves to
 “ it, have never experienced any
 “ of its bad effects ?” This diffi-
 culty, (which is in its full force,
 whatever general cause be sup-
 posed) can only be solved by
 recurring to that inexplicable *idio-
 syncrasia*, in which there is so
 remarkable a difference among
 men. But it is likewise to be re-
 membered, that the Physicians of

Germany, who, in the latter end of the last, and in the beginning of the present century, wrote concerning wine adulterated by litharge, and the general effects of it, made the same observation. The words of Zeller are, “ Multi tamen, imo
 “ innumeri ab eo læsi non fuerunt,
 “ utut ad ebrietatem usque illud
 “ hauserint ; alii leviter tantum.”

I shall only add, that it will not be easy to determine the exact quantity of lead dissolved by the acid of Cyder, unless an evaporation and an assay be made, as soon as the juice is expressed. For it seems probable, that, as it happened in the case of the adulterated wines of Germany (which, we are

informed, after a few months, lost that apparent, but pernicious improvement, which fraud had given them) the Cyder may, in some time, deposit the greatest part of its poison. But that a very small quantity of this poison is capable of producing most terrible effects, is certain from what was formerly observed in Germany. For a calculation having been made, according to the method of adulterating wines which is described by Cockelius, a measure of wine, called the *mensura Wirtenburgica major*, (which Reiselius estimates at sixty-four ounces) scarcely contained one half of a grain of litharge.

May not I presume to hope, that the present discovery of a poison, which has for many years exerted its virulent effects on the inhabitants of Devonshire, incorporated with their daily liquor, unobserved, and unsuspected, may be esteemed by those, who have power, and who have opportunities to remove the source of so much mischief, to be an object worthy of their most serious attention ? I have long lamented, that a County, which is distinguished by some peculiar blessings, should likewise be distinguished by a peculiar calamity, as it were in consequence of its fertility. The subject therefore having appeared to me important, I have spared no pains in this investigation ; and I am insured

of my reward in the consciousness of having endeavoured to preserve my countrymen and fellow-creatures from one of the most dreadful diseases, incident to the human body.

This essay will probably be hereafter published in a medicinal collection. Some copies of it are now printed, with a particular view of giving to the inhabitants of the county of Devon the earliest intimation of their danger ; in order that they may take the proper steps to preserve their health, and to secure the value of their property.

FINIS.

